UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Hiel, Clement	)		
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Customer No.:	35846	)	Art Unit:	Not yet assigned
For: ALUMINUM CONDUCTOR COMPOSITE CORE REINFORCED CABLE AND METHOD OF MANUFACTURE		)	Examiner:	Not yet assigned

Commissioner for Patents
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PRELIMINARY AMENDMENT

Sir:

In conjunction with the entry into the U.S. National Phase under 35 U.S.C. 371 of the above referenced patent application, the applicants submit this preliminary amendment. A claim listing begins on page two of this paper.

Claims 1-15 as filed with the PCT application are cancelled.

New claims 16-28 are submitted for substantive examination.

Please enter the following preliminary amendments to the claim listing.

We claim:

1. (canceled) A composite core for an electrical cable comprising:
   an inner core consisting of advanced composite material comprising at least one longitudinally oriented and substantially continuous reinforced fiber type in a thermosetting resin;
   an outer core consisting of low modulus composite material comprising at least one longitudinally oriented and substantially continuous reinforced fiber type in a thermosetting resin; and
   an outer film surrounding the composite core;
   wherein, the composite core comprises a tensile strength of at least 160 Ksi.

2. (canceled) A composite core as claimed in claim 1, wherein the reinforced fiber types of the composite core are selected from the group consisting of carbon, Kevlar, basalt, glass, aramid, boron, liquid crystal fibers, high performance polyethylene, steel hardwire filaments, steel wire, steel fiber, high carbon steel cord with adhesion optimized coatings, high carbon steel cord without adhesion optimized coatings and carbon nanofibers.

3. (canceled) A composite core as claimed in claim 1, wherein the advanced composite material comprises at least one fiber comprising a modulus of elasticity in the range of about 15 to about 45 Msi and a tensile strength in the range of at least about 350 Ksi to about 1000 Ksi.

4. (canceled) A composite core as claimed in claim 1, wherein the low modulus composite material comprises at least one fiber comprising a modulus of elasticity in the range of at least about 6 Msi to about 15 Msi and a tensile strength of at least about 180 Ksi to about 300 Ksi.

5. (canceled) A composite core as claimed in claim 1, wherein the outer film is selected from the group consisting of Kapton, Teflon, Tefzel, Tedlar, Mylar, Melonix, Tednex, PEN and PET.

6. (canceled) A composite core as claimed in claim 1 wherein the substantially continuous reinforced fiber type is twisted.

7. (canceled) A composite core as claimed in claim 1 wherein the composite core is surrounded by at least one layer of conductor.

8. (canceled) A composite core for an electrical cable comprising:
   two or more types of reinforced fiber types in a resin matrix, said core further comprising:
      at least 50% fiber volume fraction, wherein at least one fiber comprises a modulus of elasticity at least about 15 (151 GPa) to 45 Msi (255 GPa) coupled with a coefficient of thermal expansion in the range of at least about -0.6×10^{-6}/°C to about 1.0×10^{-5}/°C and a

tensile strength at least about 250 ksi (2413 MPa) and at least one fiber comprising a modulus of elasticity of at least about 9 Msi, a coefficient of thermal expansion in the range of about 5×10^{-6}/°C to about 10×10^{-6}/°C and a tensile strength of at least about 180 Ksi (1241 MPa); and
an outer film surrounding the composite core.

9. (canceled) A composite core as claimed in claim 8, wherein the outer film is selected from the group consisting of Kapton, Teflon, Tefzel, Tedlar, Mylar, Melonix, Tednex, PEN and PET.

10. (canceled) A composite core as claimed in claim 8, wherein the substantially continuous reinforced fiber type is twisted.

11. (canceled) A composite core as claimed in claim 8, wherein the composite core is surrounded by at least one layer of conductor.

12. (canceled) A method of processing a composite core for an electrical cable comprising:

pulling one or more types of longitudinally oriented and substantially continuous fiber types through a resin to form a fiber resin matrix;
removing excess resin from the fiber resin matrix;
processing the fiber resin matrix through at least one first die type to compress the fibers into a geometric shape determined by the at least one die;
introducing an outer film;
wrapping the outer film around the composite core;
processing the fiber resin matrix through at least one second die type to compress the composite core and coating; and
curing the composite core and coating.

13. (canceled) A method as claimed in claim 12 wherein, the composite core comprises at least one fiber selected from the group consisting of: carbon, Kevlar, basalt, glass, aramid, boron, liquid crystal fibers, high performance polyethylene, steel hardwire filaments, steel wire, steel fiber, high carbon steel cord with adhesion optimized coatings, high carbon steel cord without adhesion optimized coatings and carbon nanofibers.

14. (canceled) A method as claimed in claim 12 wherein, the outer film is selected from the group consisting of Kapton, Teflon, Tefzel, Tedlar, Mylar, Melonix, Tednex, PEN and PET.

15. (canceled) A method as claimed in claim 12 wherein, the step of wrapping the fiber resin matrix further comprises using one or more carding plates to shape and compress the film around the core.

16. (new) A composite core comprised of:

a matrix material, the matrix material further comprising:

a chemical formulation comprising at least a resin, at least one hardener and one or more accelerators, said formulation having elongation properties in excess of glass fiber elongation properties; and

a plurality of longitudinally extending fibers of one or more fiber types embedded in the matrix material to form a fiber/resin matrix;

wherein, the fiber/resin matrix is cured to form the composite core.

17. (new) A composite core according to claim 16, wherein the composite core comprises two or more fiber types.

18. (new) A composite core according to claim 17, wherein one fiber type is glass.

19. (new) A composite core according to claim 17, wherein one fiber type is carbon.

20. (new) A composite core according to claim 17, wherein the composite core comprises carbon fibers surrounded by glass fibers, the core having a carbon/glass fiber ratio that produces a composite core having a predetermined set of mechanical properties.

21. (new) A composite core according to claim 20, wherein the carbon/glass fiber ratio may be adjusted to change the mechanical properties of the core.

22. (new) A composite core according to claim 16, wherein at least one of the one or more fiber types comprises a modulus of elasticity in excess of glass fiber.

23. (new) A composite core according to claim 16, wherein the composite core comprises one fiber type having a modulus of elasticity in the range of about 6 to about 15 Msi.

24. (new) A composite core according to claim 23, wherein the fiber type is S-glass.

25. (new) A composite core according to claim 16, wherein at least one of the one or more fiber types comprises a modulus of elasticity in excess of glass fiber and at least one of the one or more fiber types is glass.

26. (new) A composite core according to claim 16, further comprising a protective coating surrounding the core.

27. (new) A composite core according to claim 26, further comprising one or more layers of conductor surrounding the core.

28. (new) A composite core according to claim 16, further comprising one or more layers of conductor surrounding the core.

REMARKS

I. Support for the new claims.

Claim 16:

Support for, "a matrix material, the matrix material further comprising" can be found in paragraph 33 of the specification, namely, "matrix materials embed the fibers. In other words, the matrix bundles and hold the fibers together as a unit- a load member."

Support for, "a chemical formulation comprising at least a resin, at least one hardener and one or more accelerators, said formulation having elongation properties in excess of glass fiber elongation properties, can be found in paragraph 39, namely:

"According to the present invention, resins may comprise a plurality of components in order to optimize the properties of the composite core and the fabrication process. In various embodiments, the resin comprises one or more hardener/accelerators to aid in the curing process. The accelerators chosen depend on the resin and the die temperature in the fabrication process."

Further support may be found in paragraph 40, namely, "elongation properties of the resin system should exceed that of the glass, carbon or other fibers being utilized."

Support for "a plurality of longitudinally extending fibers of one or more fiber types embedded in the matrix material to form a fiber/resin matrix, can be found in the following paragraphs in the specification:

Paragraph 33, "the matrix material may be any type of inorganic or organic material that can embed and bundle the fibers into a composite core."

Paragraph 44, "to achieve these physical characteristics, composite cores in accordance with the present invention, may comprise only one type of fiber. The composite core may be a uniform section or layer that is formed from one fiber type and one matrix type."

Paragraph 44, "most cables, within the scope of this invention, may comprise at least two distinct fiber types."

Paragraph 45, "the two fiber types may be general fiber types, fiber classes, fiber type subtypes or fiber type genera."

Support for, "the fiber/resin matrix is cured to form the composite core" may be found in paragraph 88, namely, "The first die functions further to remove excess resin from the fiber resin matrix and may begin catalyzation (or B-staging) of the resin". In addition, "in various resin systems it is desirable to have one or more heating zones within the die to active various hardeners or accelerators." In addition, in paragraph 93, "the composite core member is cured." In paragraph 94, "the post-curing process promotes increased cross-linking within the resin resulting in improved physical characteristics of the composite member." Additional support may be found in paragraph 50, "By varying the resin chemistry and processing temperatures, the resulting cured product can be tuned to provide greater strength than the sum of the individual strengths of each fiber type."

Support for claim 17 can be found in paragraph 46 of the specification, "the combination of two or more fiber types into the composite core member offers substantial improvements in strength to weight ratio over conventional materials."

Support for claims 18 and 19, can be found in paragraph 44, "the core may also be a glass fiber embedded in a polymer. In addition, in paragraph 45, "the composite core may be formed using carbon and glass."

Support for claims 20 and 21, can be found in paragraph 50, "a relative amount of each type of fiber can vary depending on the desired physical characteristics of the composite core. In addition, "by varying the particular combinations and ratios of fiber types, pre-tensioning of the

finished core may also be achieved to provide a compound improvement in the core's ultimate strength."

Support for claim 22 can be found in paragraph 44, "to achieve these physical characteristics, composite cores in accordance with the present invention may comprise only one type of fiber."

Support for claim 23 can be found in paragraph 62, "low modulus fibers may be selected from the group having the following characteristics: tensile strength within the range about 180 Ksi to 800 Ksi, a modulus of elasticity of about 6 to about 15."

Support for claim 24 can be found in paragraph 43, "there are numerous types of glass fibers. For instance, an A-glass, B-glass, C-glass, D-glass, E-glass, S-glass, AR-glass, R-glass or basalt. There are dozens of different types of glass fibers."

Support for claim 25 can be found in paragraph 61, advanced composite fibers have a modulus of elasticity of at least 15 Msi.

Support for claim 26 can be found in paragraph 65, "the composite core may also include other surface applications or surface treatments to the composite core or film around the composite core."

Support for claims 27 - 28 can be found in paragraph 102, "the final composite core can be wrapped in lightweight high conductivity aluminum forming a composite cable."

Applicant believes that the application is in condition for substantive examination and such action is requested. The Examiner is invited to telephone the undersigned if it is believed that such communication will further the prosecution of the application.

Respectfully Submitted,
The McIntosh Group

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